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REDESCRIPTION OF *COMPSOBUTHUS MATTHIESSENI* (SCORPIONES, BUTHIDAE) FROM SOUTHWESTERN ASIA

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ABSTRACT. The buthid scorpion *Compsobuthus matthiesseni* (Birula 1905) is redescribed (male lectotype here designated), based on study of type specimens and other material now available. Its placement in the genus *Compsobuthus* Vachon 1949 is discussed, and it is regarded as a valid species of the *C. acutecarinatus* group despite possessing some unique features. In particular, its elongated pedipalps and metasoma serve to readily distinguish it from other *Compsobuthus* thus far known in the region. *Compsobuthus matthiesseni* is known from a number of localities in Iran, Iraq and Turkey. Some details of the early collections made in southwestern Asia are provided.

The scorpion *Buthus acutecarinatus matthiesseni* was described by Birula in 1905 from several localities in Persia (see below for the detailed discussion). This taxon received some attention in the literature in succeeding years. Birula (1917, 1937) listed it for western Iran along with related forms from the Middle East and North Africa. These were treated as subspecies of *B. acutecarinatus* Simon 1882, but are currently recognized as separate species of the genus *Compsobuthus*. Vachon (1949) was the first to elevate *C. matthiesseni* to species status. However, the taxonomic situation has remained unclear. Levy, Amitai & Shulov (1973) expressed doubts about the generic affiliation of this species, but tentatively included it as a good species in the acutecarinatus group. Kinzelbach (1985), for reasons unstated, considered all of the species in the *acutecarinatus* group, including *C. matthiesseni*, as subspecies of *Compsobuthus acutecarinatus*. This opinion was again published by Vachon & Kinzelbach (1987). Kovarík (1996) once again elevated *matthiesseni* to species-level status.

Some of the general problems in taxonomy of Middle Eastern scorpions are due to inadequate descriptions of species and the lack of illustrations, particularly of type materials. The inaccessibility of types led many previous workers to produce varying interpretations of species, which in turn produced great uncertainty as to their true identities and geographical distributions. Although the original description of *Buthus acutecarinatus matthiesseni* by Birula (1905) is relatively thorough, it is our goal here to update that description and to discuss the placement of *matthiesseni* in the genus *Compsobuthus* Vachon. This was made possible through the courtesy of the Zoological Institute of Russian Academy of Sciences, St. Petersburg, Russia (ZISP), which allowed us to examine a number of Birula's type specimens. The species is illustrated in detail for the first time from the type material. Detailed measurements of male and female types are presented, along with a morphometric analysis of all samples examined.

Compsobuthus matthiesseni (Birula 1905) (Figs. 1–10)

Buthus acutecarinatus matthiesseni Birula 1905: 140 (key), 142–144; Birula 1917:140; Birula 1937:107.

Buthus (*Buthus*) *acutecarinatus matthiesseni* Birula 1918:25–27.

Compsobuthus Mathiesseni (sic): Vachon 1949:99; 1952:219.

? *Buthus acutecarinatus* var. *judaicus*: Whittick 1955: "2" (no actual pagination given).

Compsobuthus mathiesseni (sic): Pringle 1960:77.

Compsobuthus matthiesseni: Vachon 1966:211; Habibi 1971:43; Farzanpay 1988: 37; Kovarík 1996: 53–54.

Buthus acutecarinatus (part): Whittick 1970:5 (Baghdad record only).

Compsobuthus (?) *matthiesseni*: Levy, Amitai &

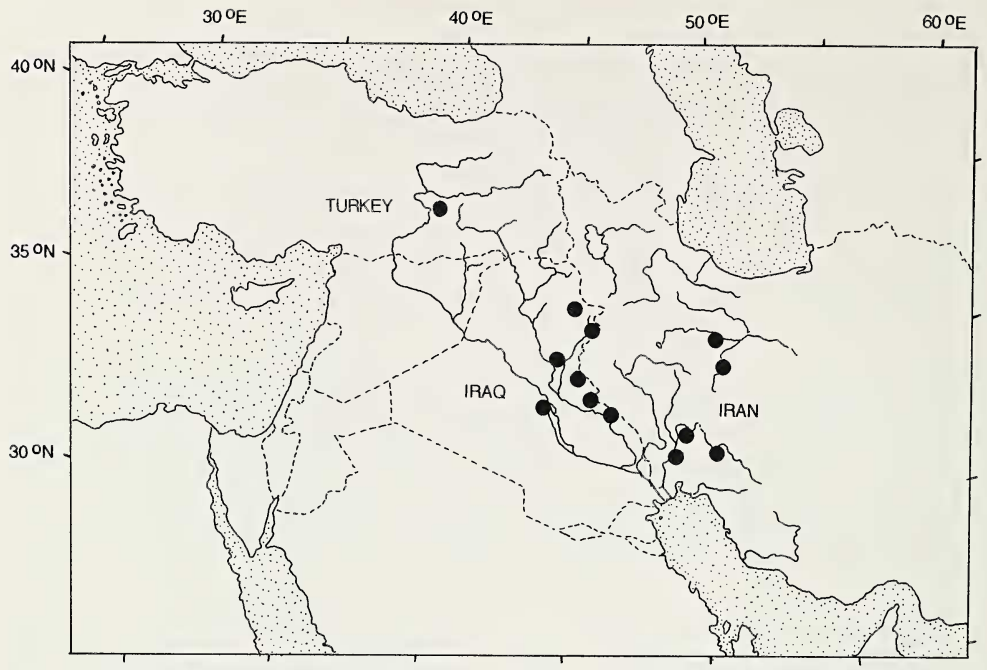


Figure 1.—Map of the Tigris-Euphrates drainage in Iran, Iraq, and Turkey showing distribution of *Compsobuthus matthiesseni*.

Shulov 1973:114, 115; Levy & Amitai 1980:60, 62.

Compsobuthus acutecarinatus matthiesseni: Kinzelbach 1985: map III; Vachon & Kinzelbach 1987: 101.

Type data.—Lectotype male and paralectotype female (herein designated) of *Buthus acutecarinatus matthiesseni* taken from "Prov. Iraq-Adshemi, die Stadt Kum", now Qum (Qom) in Markazi (Central) Prov., Iran, on 16 March 1904 by A. Matthiessen; deposited in ZISP, examined.

Distribution.—This species is known from a considerable number of localities in southwestern Iran, Iraq and southeastern Turkey (Fig. 1). Specimens listed by Birula (1905) were collected in 1904 by A. Matthiessen, who was a mining engineer, and the famous Russian zoologist Nikolai A. Zarudny. We analyzed Zarudny's travelogues and corresponding maps from the ZISP library, and were able to trace all of the localities of his collections. Birula's type series, collected by A. Matthiessen on 16 March 1904, originate from Kum (now Qum, or Qom). Zarudny's trips in 1903–1904 were concentrated along the Karun River valley, between Esfahan and Ahvaz. This area includes the following localities listed by Birula (1905: 142): Disful (now Dezful); Dehi-Dis (now Dehdez, 150 km NE from Ahvaz); Cheshme-Rogan Spring; Karavansarai Ser-i-Pul, next to the village of Malamir (now Izeh in modern Khuzestan Province); and a locality between the villages of Sarhun (now Serhun) and Gamdalkal (modern Chahar Mahal and Bakhtiari Province). Another specimen was collected by Zarudny at Nasrabad, a village next to the town of Kashan (Esfahan Province). Additional specimens from Iran were collected in 1964 by J. Neal next to Qasr-e-Shirin (modern Bakhtaran Province), close to the Iraqi border (USNM collection).

Birula (1918) described further material (2♂2♀) from Lower Mesopotamia (now Iraq) collected by P.V. Nesterov in the spring of 1914. The itinerary of this expedition is well detailed in Birula (1918: 2–6); part of its route passed from Basra (now Al-Basrah) and Amara (now Al-Amarah) along the Iranian border to the north of the Tigris River toward Mandali and Baghdad. *Compsobuthus matthiesseni* was found in the valleys of the rivers Tyb and Gengir and also next to the villages of Siaret-Seid-Hassan and Mendeli (now Mandali) (Birula 1918: 25).

Pringle (1960) lists the species from Bagh-

dad, Khanaqin, and Kirkuk in Iraq. His specimens were not examined, but were determined by Max Vachon. Kinzelbach (1985) did not include any locations from Iran, but his map shows Baghdad and a location in the Euphrates valley, close to Babylon. Kovarík (1995) confirms the species for Baghdad, and also lists the first locality in Turkey (Ergani, Diyarbakir Province). Therefore, *C. matthiesseni* appears to be distributed quite widely within the drainages of the Tigris and Euphrates Rivers and some adjacent areas in Iran, Iraq and Turkey, approximately between 30–37°N and 39–51°E.

Diagnosis.—This species, with its slender body and elongated metasoma and pedipalps, is quite distinct compared to other species of *Compsobuthus* (see Discussion), and it cannot be readily confused with any that are currently described. Within the *acutecarinatus* group, the only species to exhibit considerable elongation of the pedipalps is *C. acutecarinatus*, but its chela length/width ratio only ranges from 5.47–6.06 (in *C. matthiesseni*, male ratios range from 6.74–7.56 and female ratios from 6.18–7.00). In comparison to *C. matthiesseni*, it also has more robust metasomal segments, distinctly greater body size (40–50 mm), higher pectinal tooth counts (males with 27–29 teeth, females 20–23), a broader telson, and fused central median and posterior median carapacial carinae. *Compsobuthus longipalpus* Levy, Amitai & Shulov 1973 from the Sinai Peninsula has elongated pedipalps (chela length/width > 6.5), but has a metasoma of more typical proportions. Further, unlike *C. matthiesseni*, it is a member of the *werneri* group (with outer accessory denticles on the pedipalp chela fingers).

Redescription of lectotype.—Adult male 37.60 mm in length. Coloration: Base color light yellow, immaculate except for black pigment surrounding median and lateral eyes. *Prosoma:* Carapace slender, almost parallel-sided (Fig. 2). Ocular tubercle situated at anterior ⅓ of carapace. Anteromedian carinae weak to moderate, granulose; superciliary carinae strong, regularly denticulate; lateral ocular, central lateral, central median, and posterior median carinae moderate, irregularly denticulate. Posterior median carinae terminating distally in a small spinoid process that extends slightly beyond the posterior margin of the carapace. Central median and posterior median carinae slightly separated by a small space, but linearly arranged as in other *Compsobuthus*. Intercarinal spaces with dense fine and coarse granulation. *Mesosoma:* Tergite I with lateral carinae moderate, denticulate and on II-VI strong, denticulate; each carina terminates in a spinoid process that extends well past the posterior margin of the tergite. Median carina moderate on I, strong on II-VI; on III-VI terminating distally in a spinoid process that terminates slightly beyond tergal margin. Lateral intercarinal spaces densely, coarsely granular; median intercarinal spaces more finely granular to shagreened. Tergite VII pentacarinate: lateral pairs strong, serrate; median carina present only on proximal one-half, strong, serratocrenulate. Pectinal tooth count 23–22. Sternite III moderately hirsute; others less so. Lateral carinae absent on sternite III, faint to weak and smooth on IV-VI, strong and serrate on VII. Submedian carinae absent on sternites III-VI; moderate and finely serrate on VII. *Metasoma:* All segments elongated (Fig. 3), with segment III length/width ratio, 2.84 and V length/width ratio, 3.93; segments III-V virtually parallel-sided. Segments I-IV: Dorsolateral and lateral supramedian carinae strong, finely, irregularly serrate. Lateral inframedian carinae on I strong, finely serrate; on II represented by a weak line of granules in anterior third, and as a moderate keel on posterior two-thirds, this finely crenulate to serrate; on III indicated by a faint line of small isolated granules; on IV absent. Ventrolateral carinae on I-IV strong, finely crenulate. Ventral submedian carinae moderate, very finely serrate; these carinae provided on each segment with three pairs of setae with the third pair at the distal edge of the segments. Dorsal and lateral intercarinal spaces with scattered coarse granulation; ventral surfaces shagreened. Segment V with dorsolateral carinae moderate, serrate; lateromedian carinae indicated by an irregularly-spaced row of coarse granules; ventrolateral and ventromedian carinae strong, crenulate with the granules gradually increasing in size toward distal end. All intercarinal spaces moderately coarsely granular. *Telson:* Ventral aspect with median and paired lateral rows of rounded granules; subaculear tubercle indicated by an elevated, rounded area when viewed from lateral aspect; aculeus gently curved and relatively short (Fig. 3). *Pedipalps:* Trichobothrial pattern

Type A, orthobothriotaxic (Vachon 1974); dorsal trichobothria of femur arranged in beta-configuration (Vachon 1975). Femur (Fig. 4) slender (length/width = 4.35), pentacarinate, with all carinae moderate, more or less crenulate; inner face moderately granular with irregular oblique longitudinal keel; dorsal and ventral faces moderately granular; two short distal external accessory macrosetae. Patella (Fig. 5) octocarinate, with dorsointernal carina moderate, granular; dorsal median carina weak, granular; dorsoexternal carina weak, finely granular; exteromedian carina moderate, essentially smooth; ventroexternal carina weak, finely granular; ventromedian carina weak, smooth; ventrointernal and inner carinae strong, serrate. Patella without accessory macrosetae. Chela (Figs. 6–10) palm very slender with chela length/width ratio, 6.74; dorsal marginal and ventroexternal carinae weak, granular; other carinae of outer palm surface faint, feebly granular. Chela fingers long and tenuous, with ratio of fixed finger length/carapace length, 1.08. Fixed and movable chela fingers with 10 oblique rows of denticles (Figs. 8–9), these lacking outer accessory denticles; movable finger with 4 distal granules preceding first granular row (Fig. 10). Fixed finger trichobothria *et* opposite extreme distal end of fourth granular row, *est* opposite enlarged granule at base of fifth row (Fig. 7).

Measurements of lectotype male (mm): Total L, 37.60; carapace L, 3.70; mesosoma L, 11.45; metasoma L, 22.45; telson L, 3.85. Metasomal segments: I L/W, 3.60/1.85; II L/W, 4.20/1.60; III L/W, 4.40/1.55; IV L/W, 4.95/1.70; V L/W, 5.30/1.35. Telson: vesicle L/W/D, 2.45/1.20/1.70; aculeus L, 1.40. Pedipalps: femur L/W, 3.70/0.85; patella L/W, 4.20/1.10; chela L/W/D, 6.40/0.95/1.05; fixed finger L, 4.00; movable finger L, 4.50; palm (underhand) L, 2.05.

Measurements of paralectotype female (mm): Total L, 43.95; carapace L, 4.75; mesosoma L, 12.75; metasoma L, 22.00; telson L, 4.45. Metasomal segments: I L/W, 3.55/2.35; II L/W, 4.05/2.10; III L/W, 4.30/2.10; IV L/W, 4.75/2.00; V L/W, 5.35/1.90. Telson: vesicle L/W/D, 2.65/1.65/1.60; aculeus L, 1.80. Pedipalps: femur L/W, 4.25/1.10; patella L/W, 4.90/1.55; chela L/W/D, 7.55/1.15/1.30; fixed finger L, 4.85; movable finger L, 5.55; palm (underhand) L, 2.20.

Variation.—Juveniles bear some dusky pigmentation on the carapacial and tergal carinae, as well as the proximal portion of the fifth metasomal segment. Interestingly, the juveniles have fairly similar morphometrics to the adults, and males and females are distinguishable in the middle instars. It is highly likely that individuals mature at different instars, as is known to be the case in a number of other scorpions (e.g., *Centruroides* Marx 1889; Francke & Jones 1982).

For all adult specimens examined, morphometric variation is summarized in Tables 1 and 2. Note that females differ from males in having the metasomal segments more robust. The non-type male specimens all had proportionately longer metasomal segments than the lectotype, which is illustrated (Fig. 3). Pectinal tooth counts varied as follows: in males, 1 comb with 20 teeth, 5 combs with 21 teeth, 5 combs with 22 teeth, 15 combs with 23 teeth, 6 combs with 24 teeth, and 1 comb with 25 teeth; in females, 1 comb with 17 teeth, 2 combs with 18 teeth, 13 combs with 19 teeth, 20 combs with 20 teeth, and 7 combs with 21 teeth. The dentition of the right chela fingers in 20 specimens was also examined, and the fixed finger bore either nine (5%), 10 (85%) or 11 (10%) oblique rows of denticles; the movable finger bore either 10 (35%) or 11 rows (65%). In those specimens having eleven rows on the movable finger, the denticle at the base of the finger that separated the tenth and eleventh rows (= the enlarged granule at the base of the tenth denticle row) was generally smaller than the enlarged denticles separating other rows. When this denticle was the same size as the other denticles in the row, the two basal rows were fused into a single long row and the specimen was judged to have only 10 total rows.

Specimens examined.—IRAN: *Markazi (Central) Prov.*, Qom (Qum), 16 Mar 1904 (A. Matthiessen), 1♂ (lectotype), 1♀ (paralectotype) (ZISP, No. 53); *Chahar Mahal and Bakhtiari Prov.*, between villages Sarkhun (Serhun) and Gamdalkal, 16 km NEE Dehdez, 9–10 April 1904 (N.A. Zarudny), 2♀ (paralectotypes) (ZISP, No. 58); *Khuzestan Prov.*, Dezful, 10 March 1904 (N.A. Zarudny), 4♀ (ZISP, No. 54); *Bakhtaran (Kermanshah) Prov.*, 8 km E Qasr-e-Shirin, 15 April 1964 (J. Neal), 1 juv.♀ (USNM), 3♂, 2 juv.♂, 3♀, 6 juv.♀ (USNM). **IRAQ:** *Baghdad Prov.*, Baghdad, November 1934–April 1935 (Yusaf Lazar), 1♂2♀ (FMNH); Bagh-

Table 1.—Means ($\bar{x}$), standard deviations (SD), and ranges (min = minimum, max = maximum values) for selected measurements of *Compsobuthus matthiesseni,* based on 13 adult males and 16 adult females. Measurements are as follows: Ca L = carapace length; Fem L = pedipalp femur length; Fem W = pedipalp femur width; Ch L = pedipalp chela length; Ch W = pedipalp chela width; FF L = pedipalp chela fixed finger length; MF L = pedipalp chela movable finger length; III L = metasomal segment III length; III W = metasomal segment III width; V L = metasomal segment V length; V W = metasomal segment V width.

	Ca L	Fem L	Fem W	Ch L	Ch W	FF L	MF L	III L	III W	VL	VW
Males											
$\bar{x}$	3.73	3.71	0.86	6.33	0.89	4.00	4.48	4.42	1.47	5.32	1.28
SD	0.31	0.33	0.07	0.63	0.09	0.35	0.41	0.46	0.16	0.51	0.14
min	3.30	3.20	0.75	5.05	0.70	3.50	3.90	3.65	1.20	4.50	1.00
max	4.30	4.35	1.00	7.45	1.00	4.80	5.30	5.25	1.80	6.25	1.55
Females											
$\bar{x}$	4.19	3.80	1.02	6.76	1.02	4.37	4.96	3.73	1.80	4.66	1.64
SD	0.44	0.38	0.10	0.63	0.10	0.42	0.48	0.39	0.23	0.49	0.23
min	3.50	3.10	0.85	5.65	0.85	3.65	4.05	3.05	1.45	3.85	1.30
max	4.75	4.25	1.15	7.55	1.15	4.95	5.60	4.30	2.10	5.35	1.90

dad, 1940–42 (coll. unknown), 9♂4♀ 1 juv.♂, 1 juv.♀ (collections of the authors).

DISCUSSION

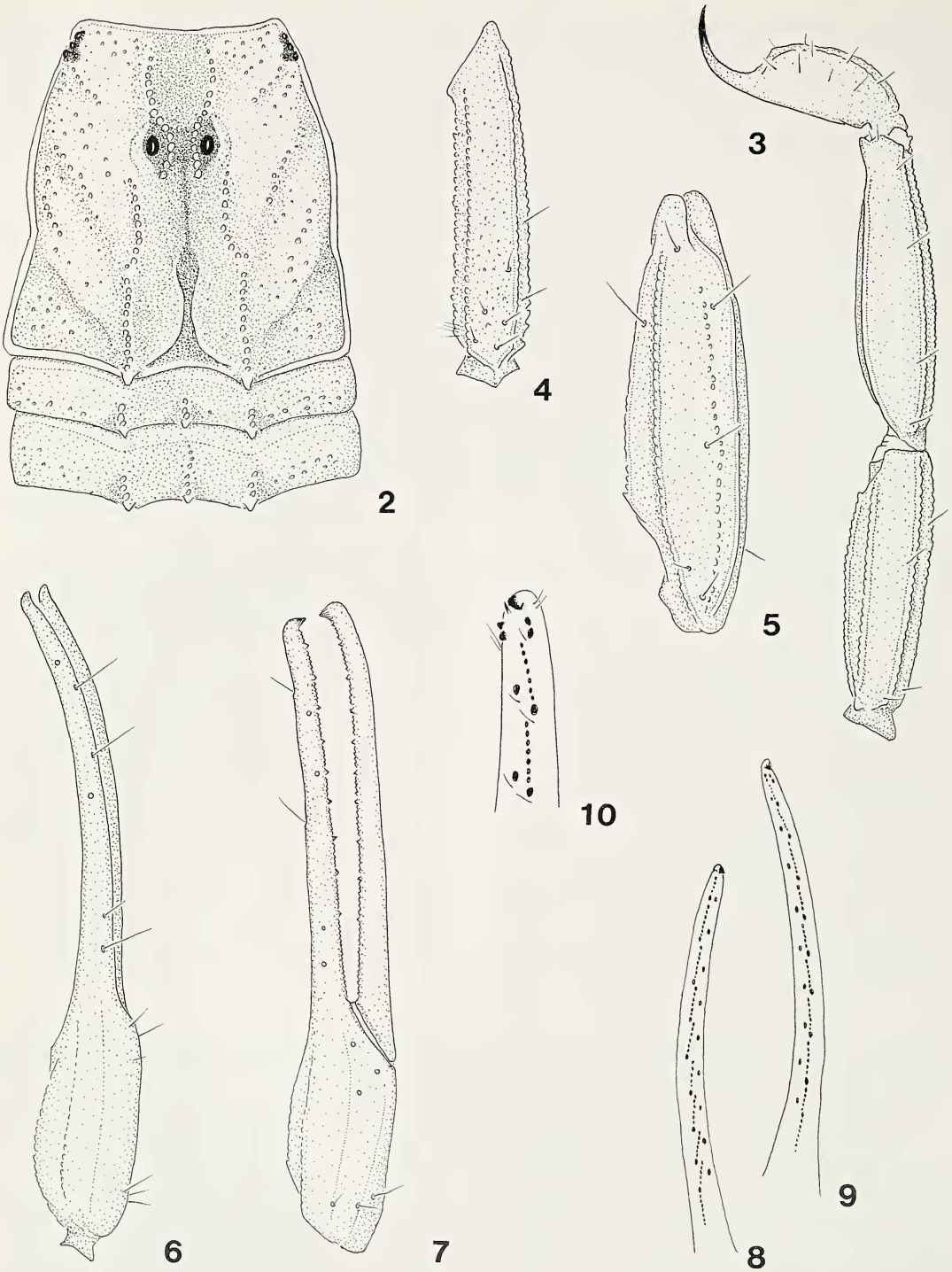
With regard to the generic placement of this species, Levy, Amitai & Shulov (1973) questioned whether or not it belonged in the genus *Compsobuthus*, based on its atypical carapacial carination, with the central median and posterior median carinae not completely fused, its elongated metasoma, and the shape of its telson. Although the carapacial carinae are not fused, they are in a linear arrangement (Fig. 2) as in other *Compsobuthus*. In addition, the terminal spines of these carinae and the three carinae of the tergites do not protrude as far beyond the posterior margins of the carapace and tergites, respectively, as in other *Compsobuthus*, but are nevertheless distinct.

The illustration by Pringle (1960: 77) indicates enlarged denticles at the distal end of the ventrolateral carinae of metasomal segment V. This may merely represent an error in illustrating the specimen. The type specimens, as well as non-type specimens from Baghdad that we examined, do not exhibit this feature; the keels are more or less evenly crenulated from anterior to posterior, as in other *Compsobuthus*. Otherwise, Pringle's illustration is consistent with *C. matthiesseni*.

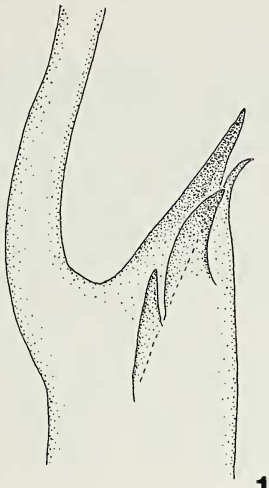
We do not attach great significance to the

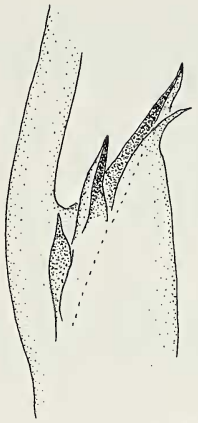
Table 2.—Means ($\bar{x}$), standard deviations (SD), and ranges (min = minimum, max = maximum values) for selected morphometric ratios of *Compsobuthus matthiesseni,* based on 13 adult males and 16 adult females. Ratios are based on the same abbreviations listed in Table 1.

	Ch L/W	FF L/ChL	FF L/Ca L	MF L/V L	III L/W	V L/W	Fem L/W
Males							
$\bar{x}$	7.10	0.63	1.07	0.84	3.02	4.18	4.33
SD	0.24	0.02	0.02	0.03	0.20	0.30	0.10
min	6.74	0.61	1.04	0.79	2.70	3.75	4.12
max	7.56	0.69	1.12	0.90	3.46	4.70	4.50
Females							
$\bar{x}$	6.67	0.65	1.04	1.07	2.07	2.85	3.72
SD	0.44	0.38	0.10	0.63	0.10	0.42	0.48
min	6.18	0.63	0.98	0.98	1.98	2.63	3.44
max	7.00	0.66	1.13	1.15	2.26	3.18	3.90



Figures 2–10.—Morphology of *Compsobuthus matthiesseni* (all drawings of lectotype male), except as indicated. 2, Dorsal aspect, showing carapace and first two tergites; 3, Lateral view of metasomal segments IV and V and the telson; 4, Dorsal aspect of pedipalp femur; 5, Dorsal aspect of pedipalp patella; 6, Dorsal aspect of pedipalp chela; 7, External aspect of pedipalp chela; 8, Dentition of pedipalp chela fixed finger; 9, Dentition of pedipalp chela movable finger; 10, Enlargement of distal end of pedipalp chela movable finger.





Figures 11–12.—Morphology of the hemispermatophore of *Compsobuthus matthiesseni* (non-type male from Baghdad). 11, Dorsal aspect of right hemispermatophore, showing arrangement of lobes at base of flagellum; 12, Right hemispermatophore from ental-dorsal angle (terminology after Lamoral 1979).

elongation of the metasomal segments in this species as a possible character of generic importance, although we consider it an exceptional species character. In the New World genus *Centruroides* for example, most species have elongated metasomal segments (particularly in the male), but there are notable exceptions in which dimorphism in metasoma length is greatly reduced [e.g., *C. testaceus* (DeGeer 1778), *C. exsul* (Meise 1934), *C. rileyi* Sissom 1995]. Interspecific differences in the occurrence of sexual dimorphism in metasoma length, as well as in the degree of dimorphism, are also known in *Uroplectes* Peters 1861 in southern and eastern Africa, *Isometrus* Hemprich & Ehrenberg 1829 in Africa and Asia, *Tityus* C.L. Koch 1836 in Central and South America, and others. The slenderness of the telson is also distinctive in *C. matthiesseni*—however, this is most notable in the male and is not unique to this species. In general, those species with more slender metasomal segments will have more slender telsons; the presence or absence, as well as the shape, of the subaculear tubercle is also not exceptional. *Compsobuthus vachoni* Sissom 1994 has a larger subaculear tubercle than that seen in *C. matthiesseni*.

Finally, we were able to dissect the hemispermatophore of this species. The basic structure, including the arrangement of the lobes at the base of the flagellum (Figs. 11–12), is consistent with that found in other *Compsobuthus*, as illustrated in several species by Levy & Amitai (1980). In conclusion, we feel that *C. matthiesseni* is clearly related to the other species in the genus and appropriately belongs in *Compsobuthus*.

Kinzelbach (1985) and Vachon & Kinzelbach (1987) placed *C. matthiesseni* once again as a subspecies of *Compsobuthus acutecarinatus*. This scorpion is quite distinct from *C. acutecarinatus* (see Diagnosis), and it is our opinion that the taxonomic arrangement proposed by Levy, Amitai & Shulov (1973), with *C. matthiesseni* as a valid species in the *acutecarinatus* group, is more appropriate. Additional comments on the species groups of *Compsobuthus* to this effect have been published elsewhere (Sissom 1994).

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